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can see no better logical warrant for attributing to me the opinion that I can conceive of the retinal image, but not of its inversion; for, most assuredly, I have said nothing of the sort, and I find all the physiological antecedents to vision equally inconceivable.

If something in the minds of certain writers leads them to believe that I adhere to an obsolete and worthless hypothesis of vision I am helpless, for while I have the right to demand that my words shall pass at their face value I have no way to defend this right except an appeal to unprejudiced readers.

I cannot conceive of the antipodes, and if C. L. F. infers that I accept the astronomy of Homer I must bear up as well as I can.

Both the rotundity of the earth and the inversion of the retinal image are proved by ample evidence, but apprehension of the proof of a truth is a very different thing from conception of the truth itself, and no one who is not totally destitute of imagination could confuse the one with the other; although it may be well to remind C. L. F. that I have nowhere said that 'there is anything which needs explanation in the fact that the image on the retina is inverted,' and that it is because the evidence is conclusive that I made use of the inversion to illustrate that great law of logic that '*the test of truth is evidence and not conceivability.*' (SCIENCE, Oct. 4, 1895.)

If any reader cares to ask what has called forth all this criticism, which has occupied the pages of SCIENCE for more than six months, he may be surprised to find that my statement about the retinal image was nothing more than an incidental illustration of less than a dozen words in an article in SCIENCE, October 4, 1895, in which I tried to show that "the mental vice to which we are most prone is our tendency to believe that lack of evidence for an opinion is a reason for believing something else."

The correspondence which this illustration has excited seems to show that I should have done well to state this truth in a more general form, and to point out that the mental vice to which we are most prone is our tendency to interpret a negation as an affirmation of something else.

W. K. BROOKS.

#### CERTITUDES AND ILLUSIONS.

TO THE EDITOR OF SCIENCE: In my first article on 'Certitudes and Illusions,' I cited two illustrious examples of persons who had lapsed into reification, namely, Spencer in his 'First Principles,' where he reifies force, and Hegel in his Logic where he reifies idea or comprehension; but I did not attempt to exhibit Spencer's reification of force or Hegel's reification of idea. In that article I tried to set forth the nature of the subject-matter of a series of articles which I had planned and promised the editor.

Fichte has seized upon certain of Kant's reifications and those of others and reasoned about non-existent abstractions or pure properties of mind, and in his presentation has naïvely reduced the whole method of reasoning to an absurdity; but he died a disappointed and sad man because he had not consciously discovered that he had murdered his own methods. Hegel seems to have discovered this and to have characterized pure abstraction in no unmeasured terms, notwithstanding which he finally fell into the same vice and reified idea. In my first article Hegel's illusion was not set forth, but only reference made to the matter for the purpose of calling attention to the subject-matter of which I wish to treat. I shall not ignore or underestimate Spencer's contribution to the biology of the lower animals nor his contribution to psychology. In the same manner I shall not underestimate Hegel's acute reasoning in his system of logic, but I shall attempt to show that Hegel accepts Kant's doctrine of antinomies and develops this doctrine into a logic of contradiction and by its use reifies idea and ends as an absolute idealist. Now, Mr. Editor, permit me to say this word in reply to Prof. Royce, whose letter is in every way kind, but whose error consists in supposing that I attributed to Hegel all of the reifications mentioned in my article.

If he will take down the *Phänomenologie des Geistes* and read in the first chapter what Hegel has said about the demonstratives, and then read what I have said about them, he will discover to what I had reference in the treatment and use of these demonstratives, and maybe he will further discover that I have a purpose in speak-

ing of the demonstratives, as I intend ultimately to develop certain doctrines of language most clearly brought out by them.

Since writing the above the managing editor of this journal has kindly forwarded the proof sheets of Prof. Fullerton's article, about which I beg to be indulged in a brief statement.

In my first paper it will be seen that I did not attempt to demonstrate anything; for I said: "In the following chapters an attempt will be made to show that we know much about matter, and although we do not know all, all we know is about matter in its categories of number, extension, motion, duration and judgment, or that we know of matter in its four categories and that we know of mind in the categories of judgment, but always this mind is associated with matter. In doing this we shall endeavor to discriminate between the certitudes and illusions current in human opinion."

I merely attempted to explain the nature of the problems which I designed to discuss and to show that these problems are fundamental to metaphysic and to science alike. To indicate that there are two views of these problems—the metaphysical view and the scientific view—I shall attempt to set forth a series of certitudes and another series of illusions which relate to these certitudes. If I prosper in my demonstration I shall show that the certitudes come from science and that the illusions come from metaphysic. Now it must be understood that metaphysic does not deal wholly with illusions but that fundamental illusions are developed by metaphysical reasoning, and I shall further show that science attempts to deal with certitudes, but often fails by adopting the method of metaphysic and still oftener adopts its illusions. The illusions which I shall attempt to explain will be chiefly illusions of metaphysic, but they will also be illusions of science, because science has not wholly divested itself of metaphysical reasoning. The certitudes which I shall attempt to demonstrate I shall hold myself ready to maintain until my errors are shown; if such errors are demonstrated I shall promptly confess and eschew. I do not know that the man who has published can fully assume this attitude, for in a long life of scientific reading I have discovered

that publication is wax in the ears and thus a source of profound deafness to the voice of reason. If Prof. Fullerton will kindly attend to the propositions I shall attempt to demonstrate, he will be able to put me right where I am wrong, and I hope that he will be able to reinforce my certitudes by firmer rings of reasoning.

Professor Fullerton seems to be surprised and agrieved that an anthropologist should express opinions concerning metaphysic. The Professor may be interested to know that anthropology includes metaphysic as one of its themes of study for the purpose of discovering its certitudes and illusions and it sometimes finds in its ancient asphodel fields phantom flowers that turn to ashes when plucked by the hand of science.

J. W. POWELL.

#### SCIENTIFIC LITERATURE.

*Geological Biology; an introduction to the geological history of organisms.* By HENRY SHALER WILLIAMS. New York, Henry Holt, 1895. xx+395, pp. 8°. Illustrated.

Prof. Williams tells us that this book was originally written in the form of lectures delivered at Cornell University, which have been rewritten and elaborated so as to be available for use as a text-book as well as an exposition of principles. It has been prepared with a view to its use not only by students, but also the general reader "who is supposed to know something of the present popular theories regarding organic life, and has, perhaps, already become aware of the increasing sense of disappointment which those are meeting who have attempted seriously to apply them to the solutions of the problems of human life." It is not assumed that the reader has any special knowledge of biology or geology, and therefore many details are entered upon which would be superfluous for the specialist. "In defining our topic as geological biology we are not proposing to investigate the anatomical organs and tissues of which particular animals are made, but to review the facts and theories which have led to the belief that each living animal and plant is but the last of a long line of organisms whose remains can be recognized in more or less perfect fossils and whose varying characters can be traced back into the